FIG. 1

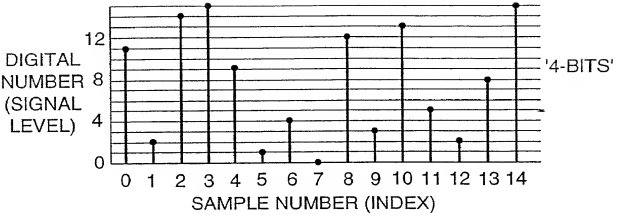

DIGITAL NUMBER (SIGNAL LEVEL)
12
8
4
0
'4-BITS'
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
SAMPLE NUMBER (INDEX)

FIG. 4

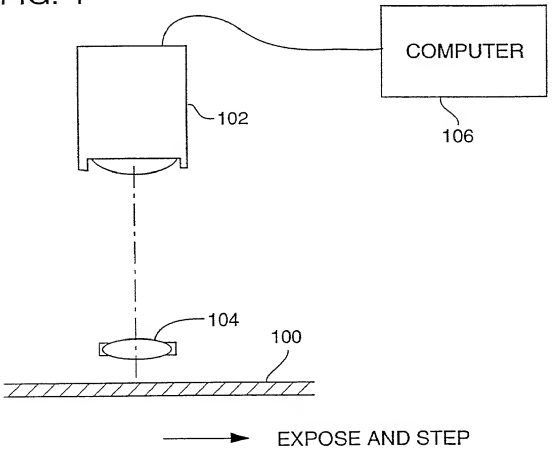

COMPUTER
102
106
104
100
EXPOSE AND STEP

FIG. 2

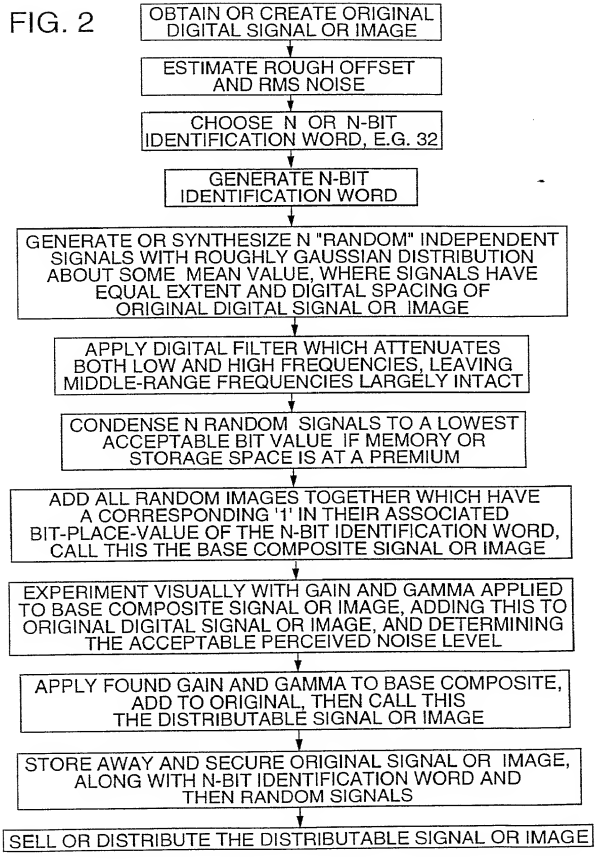

OBTAIN OR CREATE ORIGINAL DIGITAL SIGNAL OR IMAGE
ESTIMATE ROUGH OFFSET AND RMS NOISE
CHOOSE N OR N-BIT IDENTIFICATION WORD, E.G. 32
GENERATE N-BIT IDENTIFICATION WORD
GENERATE OR SYNTHESIZE N "RANDOM" INDEPENDENT SIGNALS WITH ROUGHLY GAUSSIAN DISTRIBUTION ABOUT SOME MEAN VALUE, WHERE SIGNALS HAVE EQUAL EXTENT AND DIGITAL SPACING OF ORIGINAL DIGITAL SIGNAL OR IMAGE
APPLY DIGITAL FILTER WHICH ATTENUATES BOTH LOW AND HIGH FREQUENCIES, LEAVING MIDDLE-RANGE FREQUENCIES LARGELY INTACT
CONDENSE N RANDOM SIGNALS TO A LOWEST ACCEPTABLE BIT VALUE IF MEMORY OR STORAGE SPACE IS AT A PREMIUM
ADD ALL RANDOM IMAGES TOGETHER WHICH HAVE A CORRESPONDING '1' IN THEIR ASSOCIATED BIT-PLACE-VALUE OF THE N-BIT IDENTIFICATION WORD, CALL THIS THE BASE COMPOSITE SIGNAL OR IMAGE
EXPERIMENT VISUALLY WITH GAIN AND GAMMA APPLIED TO BASE COMPOSITE SIGNAL OR IMAGE, ADDING THIS TO ORIGINAL DIGITAL SIGNAL OR IMAGE, AND DETERMINING THE ACCEPTABLE PERCEIVED NOISE LEVEL
APPLY FOUND GAIN AND GAMMA TO BASE COMPOSITE, ADD TO ORIGINAL, THEN CALL THIS THE DISTRIBUTABLE SIGNAL OR IMAGE
STORE AWAY AND SECURE ORIGINAL SIGNAL OR IMAGE, ALONG WITH N-BIT IDENTIFICATION WORD AND THEN RANDOM SIGNALS
SELL OR DISTRIBUTE THE DISTRIBUTABLE SIGNAL OR IMAGE

FIG. 3

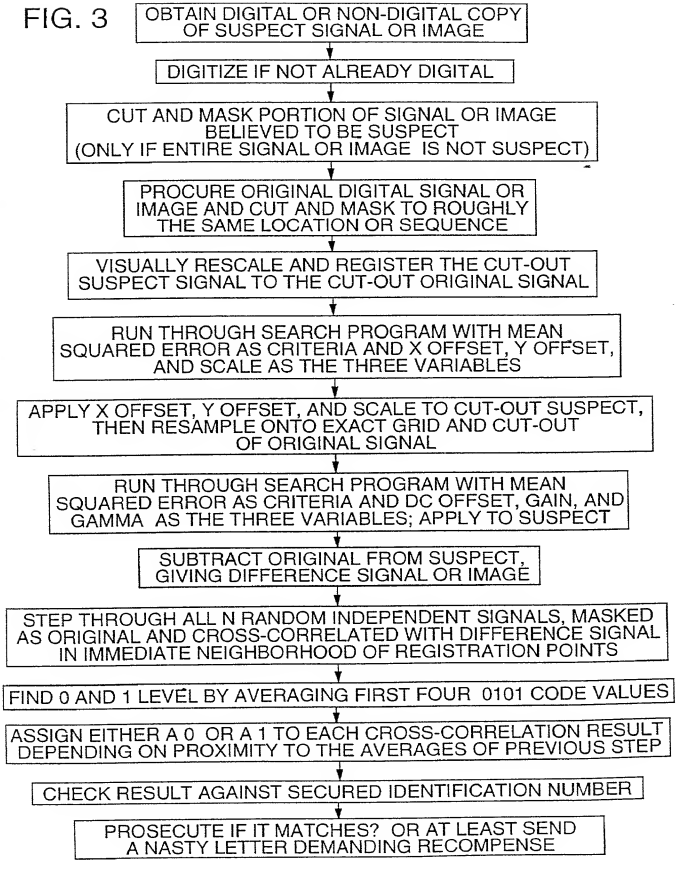

OBTAIN DIGITAL OR NON-DIGITAL COPY OF SUSPECT SIGNAL OR IMAGE
DIGITIZE IF NOT ALREADY DIGITAL
CUT AND MASK PORTION OF SIGNAL OR IMAGE BELIEVED TO BE SUSPECT (ONLY IF ENTIRE SIGNAL OR IMAGE IS NOT SUSPECT)
PROCURE ORIGINAL DIGITAL SIGNAL OR IMAGE AND CUT AND MASK TO ROUGHLY THE SAME LOCATION OR SEQUENCE
VISUALLY RESCALE AND REGISTER THE CUT-OUT SUSPECT SIGNAL TO THE CUT-OUT ORIGINAL SIGNAL
RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND X OFFSET, Y OFFSET, AND SCALE AS THE THREE VARIABLES
APPLY X OFFSET, Y OFFSET, AND SCALE TO CUT-OUT SUSPECT, THEN RESAMPLE ONTO EXACT GRID AND CUT-OUT OF ORIGINAL SIGNAL
RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND DC OFFSET, GAIN, AND GAMMA AS THE THREE VARIABLES; APPLY TO SUSPECT
SUBTRACT ORIGINAL FROM SUSPECT, GIVING DIFFERENCE SIGNAL OR IMAGE
STEP THROUGH ALL N RANDOM INDEPENDENT SIGNALS, MASKED AS ORIGINAL AND CROSS-CORRELATED WITH DIFFERENCE SIGNAL IN IMMEDIATE NEIGHBORHOOD OF REGISTRATION POINTS
FIND 0 AND 1 LEVEL BY AVERAGING FIRST FOUR 0101 CODE VALUES
ASSIGN EITHER A 0 OR A 1 TO EACH CROSS-CORRELATION RESULT DEPENDING ON PROXIMITY TO THE AVERAGES OF PREVIOUS STEP
CHECK RESULT AGAINST SECURED IDENTIFICATION NUMBER
PROSECUTE IF IT MATCHES? OR AT LEAST SEND A NASTY LETTER DEMANDING RECOMPENSE

FIG. 5

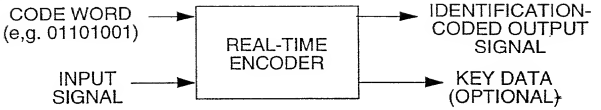
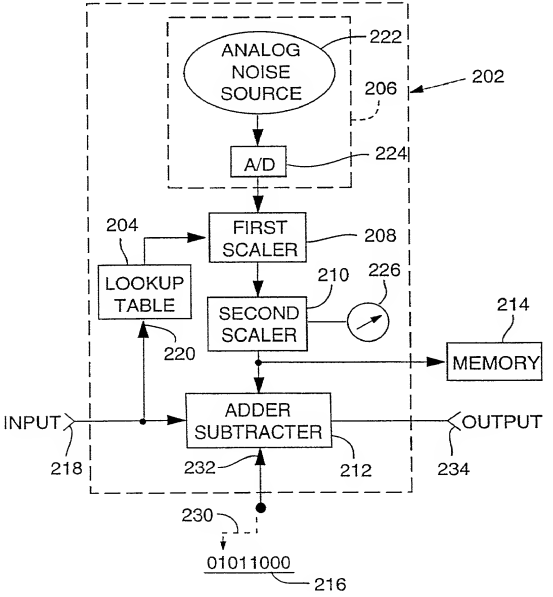

CODE WORD
(e,g. 01101001)
INPUT
SIGNAL
REAL-TIME
ENCODER
IDENTIFICATION-
CODED OUTPUT
SIGNAL
KEY DATA
(OPTIONAL)

FIG. 6


ANALOG
NOISE
SOURCE
222
206
202
A/D
224
204
FIRST
SCALER
208
LOOKUP
TABLE
210
226
SECOND
SCALER
214
220
MEMORY
INPUT
ADDER
SUBTRACTER
OUTPUT
218
232
212
234
230
01011000
216

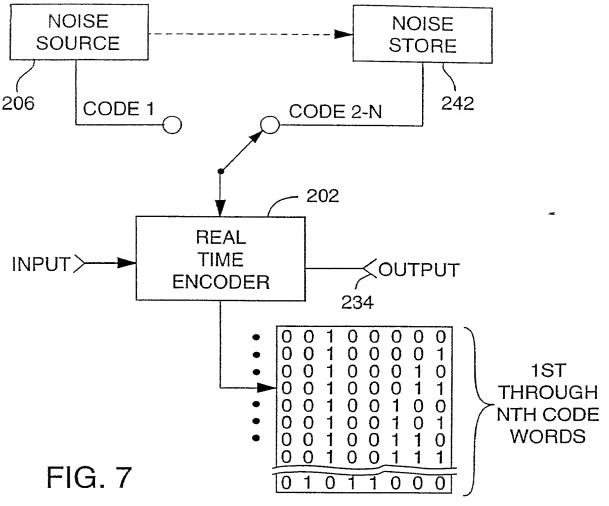

NOISE SOURCE
NOISE STORE
206
CODE 1
CODE 2-N
242
202
REAL TIME ENCODER
INPUT
OUTPUT
234
0 0 1 0 0 0 0 0
0 0 1 0 0 0 0 1
0 0 1 0 0 0 1 0
0 0 1 0 0 0 1 1
0 0 1 0 0 1 0 0
0 0 1 0 0 1 0 1
0 0 1 0 0 1 1 0
0 0 1 0 0 1 1 1
0 1 0 1 1 0 0 0
1ST THROUGH NTH CODE WORDS

FIG. 7

FIG. 8

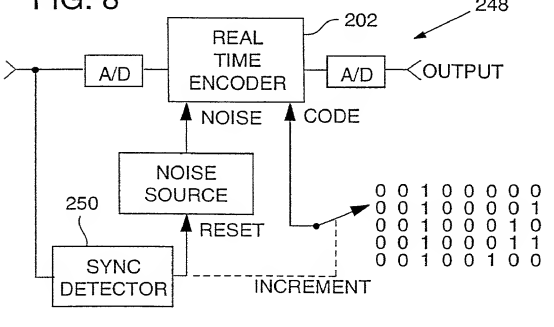

248
202
REAL TIME ENCODER
A/D
A/D
OUTPUT
NOISE
CODE
NOISE SOURCE
250
RESET
SYNC DETECTOR
INCREMENT
0 0 1 0 0 0 0 0
0 0 1 0 0 0 0 1
0 0 1 0 0 0 1 0
0 0 1 0 0 0 1 1
0 0 1 0 0 1 0 0

FIG. 9A

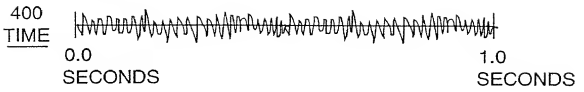


FIG. 9B

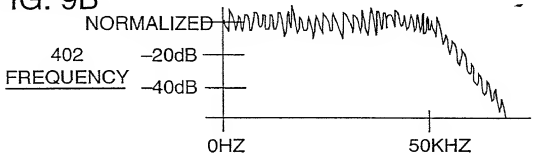


FIG. 9C

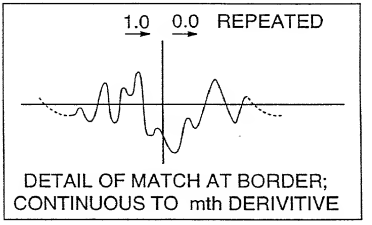


FIG. 10

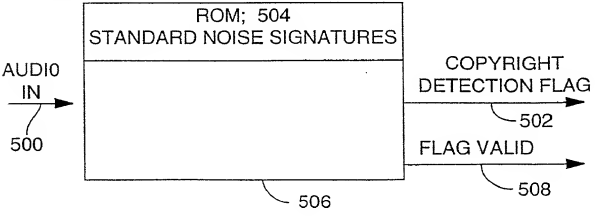


FIG. 11

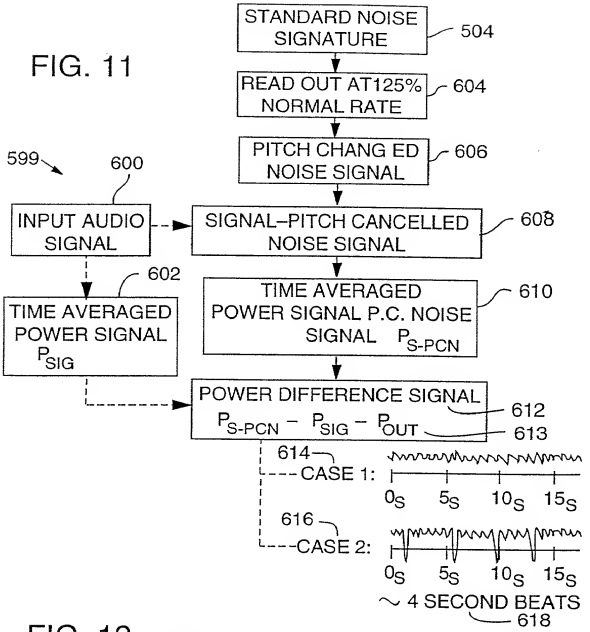

STANDARD NOISE SIGNATURE
504
READ OUT AT125% NORMAL RATE
604
PITCH CHANG ED NOISE SIGNAL
606
599
600
INPUT AUDIO SIGNAL
SIGNAL–PITCH CANCELLED NOISE SIGNAL
608
602
TIME AVERAGED POWER SIGNAL P_{SIG}
TIME AVERAGED POWER SIGNAL P.C. NOISE SIGNAL P_{S-PCN}
610
POWER DIFFERENCE SIGNAL
$P_{S-PCN} - P_{SIG} - P_{OUT}$
612
613
614
CASE 1:
0_S 5_S 10_S 15_S
616
CASE 2:
0_S 5_S 10_S 15_S
4 SECOND BEATS
618

FIG. 12

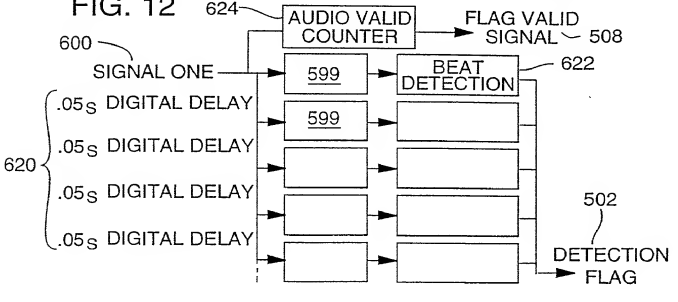
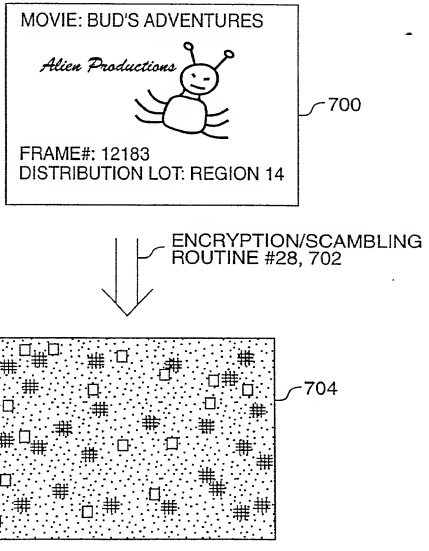
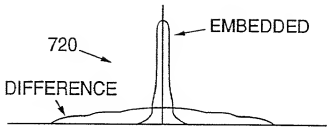

624
AUDIO VALID COUNTER
FLAG VALID SIGNAL
508
600
SIGNAL ONE
599
BEAT DETECTION
622
.05S DIGITAL DELAY
599
.05S DIGITAL DELAY
620
.05S DIGITAL DELAY
.05S DIGITAL DELAY
502
DETECTION FLAG

FIG. 13

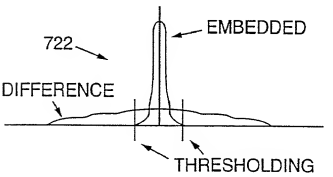


PSEUDO-RANDOM MASTER SNOWY IMAGE
(SCALED DOWN AND ADDED TO FRAME 12183)

FIG. 14



MEAN-REMOVED HISTOGRAMS OF DIFFERENCE SIGNAL AND KNOWN EMBEDDED CODE SIGNAL



MEAN-REMOVED HISTOGRAMS OF FIRST DERIVATIVES (OR SCALER GRADIENTS IN CASE OF AN IMAGE)

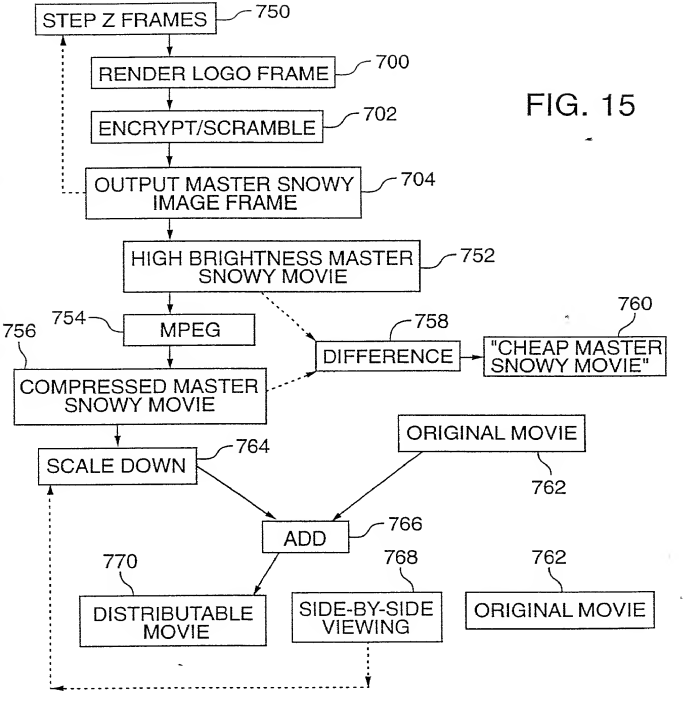

STEP Z FRAMES
750
RENDER LOGO FRAME
700
ENCRYPT/SCRAMBLE
702
OUTPUT MASTER SNOWY IMAGE FRAME
704
HIGH BRIGHTNESS MASTER SNOWY MOVIE
752
754
MPEG
756
COMPRESSED MASTER SNOWY MOVIE
758
DIFFERENCE
760
"CHEAP MASTER SNOWY MOVIE"
ORIGINAL MOVIE
762
SCALE DOWN
764
ADD
766
770
DISTRIBUTABLE MOVIE
768
SIDE-BY-SIDE VIEWING
762
ORIGINAL MOVIE

FIG. 15

FIG. 16

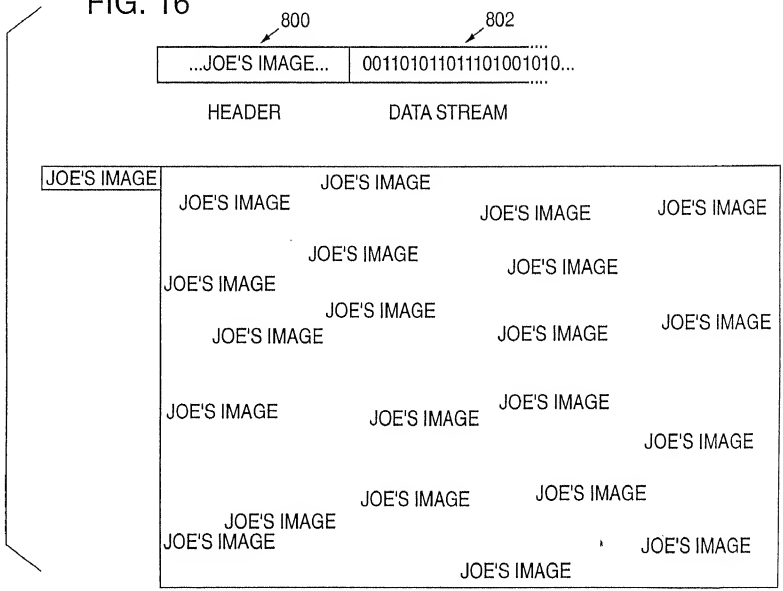
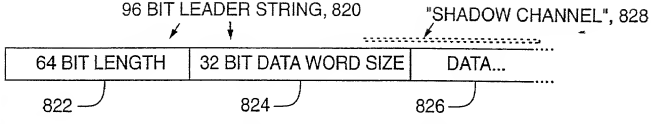

800
802
...JOE'S IMAGE...
00110101101110100101 0...
HEADER
DATA STREAM
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE
JOE'S IMAGE

FIG. 17



UNIVERSAL EMPIRICAL DATA FORMAT

FIG. 18

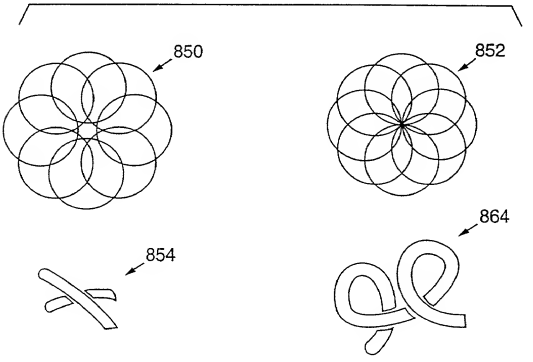


FIG. 19

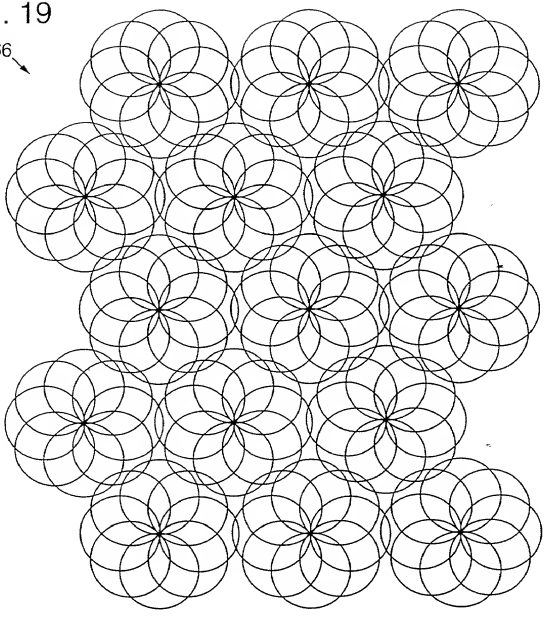

866

FIG. 20

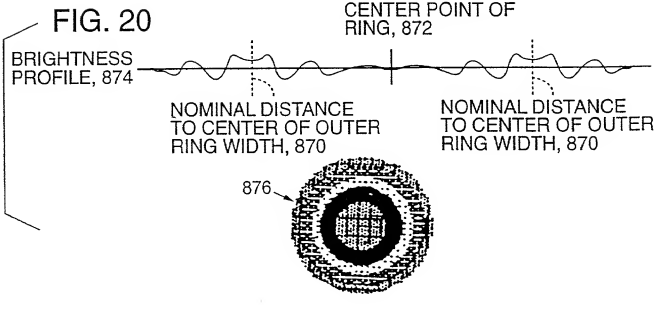

CENTER POINT OF RING, 872
BRIGHTNESS PROFILE, 874
NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870
NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870
876

FIG. 21A

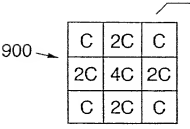


FIG. 21B

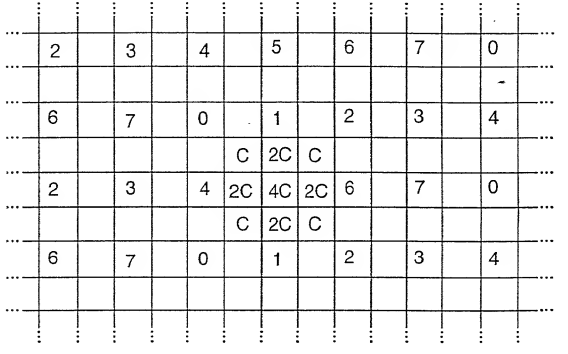
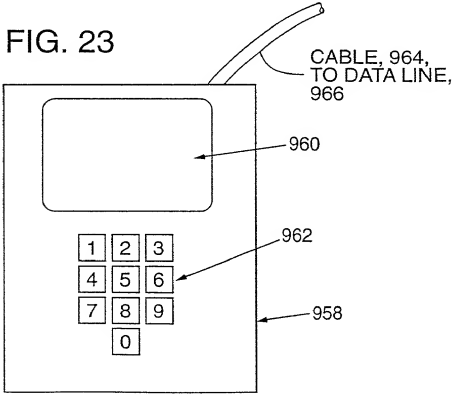


FIG. 23



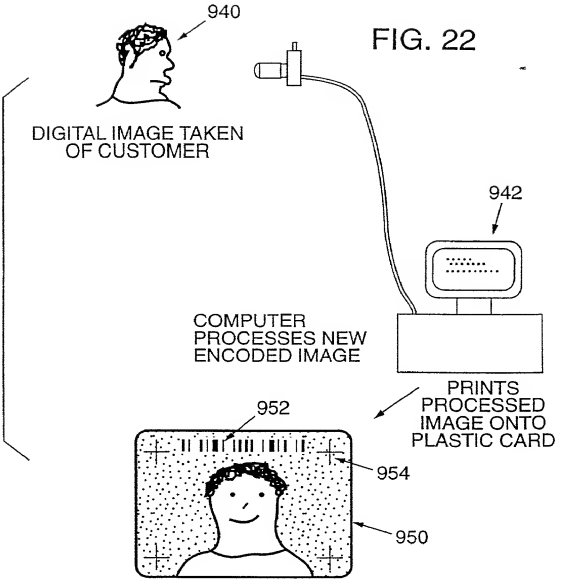
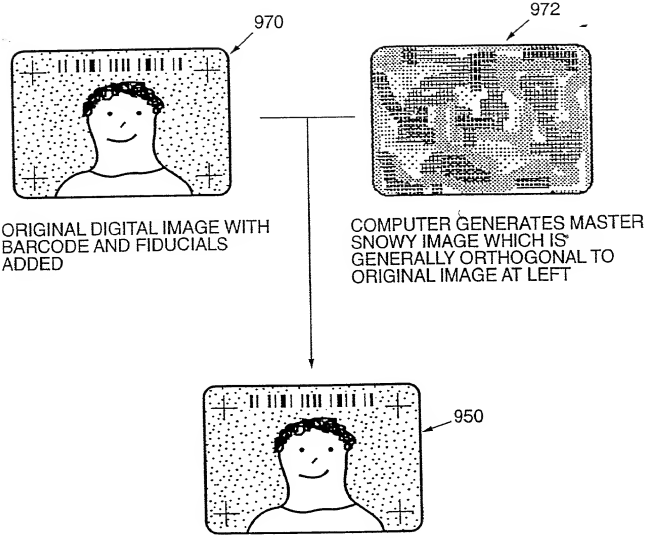

940
DIGITAL IMAGE TAKEN OF CUSTOMER
942
COMPUTER PROCESSES NEW ENCODED IMAGE
PRINTS PROCESSED IMAGE ONTO PLASTIC CARD
952
954
950

FIG. 22

FIG. 24


970
972
ORIGINAL DIGITAL IMAGE WITH BARCODE AND FIDUCIALS ADDED
COMPUTER GENERATES MASTER SNOWY IMAGE WHICH IS GENERALLY ORTHOGONAL TO ORIGINAL IMAGE AT LEFT
950
COMBINED TO FORM PERSONAL CASH CARD

US5265008 Claim

FIG. 25 TYPICAL TRANSACTION STEPS

1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSON'S ID
2. OPTIONAL: USER KEYS IN PIN NUMBER
3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
8. READER STEPS THROUGH THE TWENTY-FOUR SETS

8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS

8B. READER PERFORMS DOT PRODUCT OF RESULTANT PATTERN AND CARD SCAN, STORES RESULT

9. READER TRANSMITS THE TWENTY-FOUR DOT PRODUCT RESULTS TO CENTRAL NETWORK
10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER
11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 26

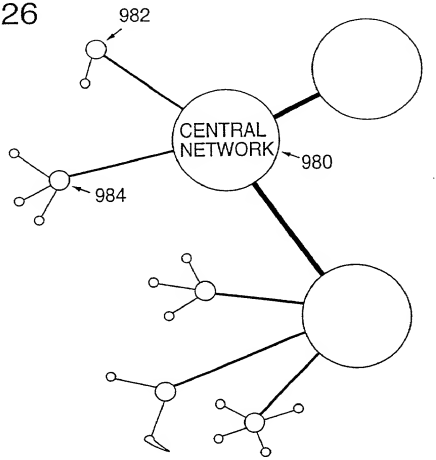
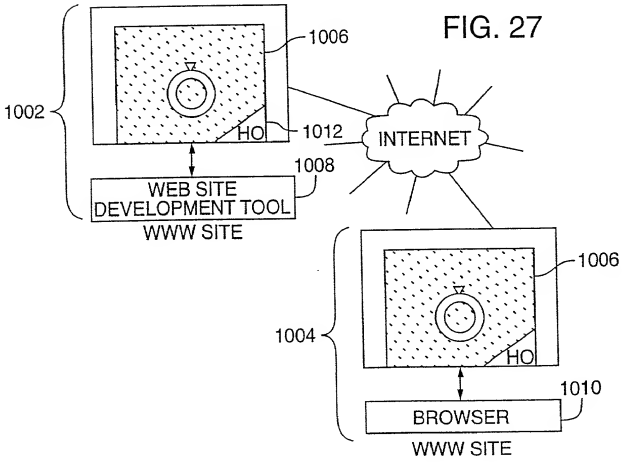

982
CENTRAL NETWORK
980
984

FIG. 27


1002
1006
HO
1012
INTERNET
1008
WEB SITE DEVELOPMENT TOOL
WWW SITE
1004
1006
HO
1010
BROWSER
WWW SITE